The Boeing Company
P.O. Box 516
St. Louis, MO 63166-0516
(314) 232-0232

107A-6580-JWH
February 2, 2011

Ms. Christine Kump-Mitchell, P.E.
Environmental Engineer, Permits Section
Missouri Department of Natural Resources
Hazardous Waste Program
7545 South Lindbergh
St Louis, MO 63125

BOEING

Re: Residual LNAPL at Boeing Tract I Facility

Dear Ms. Kump-Mitchell:

The attached report presents a comprehensive evaluation of the historic and current status of light non-aqueous phase liquid (LNAPL) at the Boeing Tract 1 site. As part of the closure process for underground storage tanks under the Remediation Unit, LNAPL has been recovered from several wells at four sites (R0002046, R0002477, R0002516, and R0002517) in Risk Areas 1 and 2 using vacuum trucks. Based on our evaluation, currently the residual/trace LNAPL is localized, not mobile, and not a source of on-going groundwater impacts. Therefore, in the Corrective Measures Study (CMS) we do not intend to present any remedial options to deal with the trace LNAPL. (The attached report or a variation will be included in the CMS.)

We request that you please review the attached report so we can reach some tentative agreement prior to the submission of the CMS. This is consistent with our mutual desire to work together to resolve certain issues upfront so the final CMS will be easier to review by the Agencies.

If you have any questions, please call me or our consultants Atul Salhotra or Kendall Pickett at 713-784-5151.

Sincerely,

Joe Haake

Joe Haake
Environmental Scientist
(314) 777-9181

cc: Joletta Golik, City of STL Airport Authority
Rich Nussbaum, MoDNR
Atul Salhotra, RAM Group
Bruce Stuart, MoDNR
Amber Whisnant, US EPA Region 7

RCRA

516830

EVALUATION OF LIGHT NON AQUEOUS PHASE LIQUID
Boeing Tract 1 Facility, Hazelwood Missouri

1.0 OBJECTIVE

Light non-aqueous phase liquid (LNAPL) removal, gauging data, and the concentrations at wells with LNAPL were evaluated to determine whether:

- LNAPL is an ongoing source for groundwater impacts, and
- If there is a need to continue further remediation of LNAPL.

2.0 DATA EVALUATION

Figure 1 shows the location of wells with current and historic detection of LNAPL. Table 1 presents all the available data related to LNAPL measurements and Table 2 presents the gauging data for the wells that had LNAPL since 2008. LNAPL has never been observed in Risk Areas 4, 5, 7, 8, and 9.

The petroleum products used in Risk Area 1 and 2 were jet fuels and gasoline which contain paraffins (primarily, C6-C16) and aromatic compounds. Paraffins are typically not considered chemicals of concern (COCs) since their degradation rates are high and the human health risk for these compounds is low and were not included in the sampling and analysis plan. Several aromatic constituents were measured as a part of the various ground water monitoring events.

2.1 Risk Area 1 (Runway Protection Zone)

Historically sixteen wells in Area 1 had LNAPL but only five wells have indicated LNAPL since 2008 (Table 2). Of the sixteen wells, five wells have not been gauged since 2008 and MW-A2 and MW-A21 are missing or have been demolished. The five wells that were not gauged are expected to have a similar LNAPL thickness compared to the wells that were gauged as all these wells are in the same area. The maximum LNAPL thickness observed in Area 1 since 2008 is 0.01 ft. During October/November 2010 groundwater monitoring event, none of these wells had a measurable thickness, although a sheen was observed in four wells.

Groundwater samples were collected from below the LNAPL from five wells to determine whether the trace LNAPL was a continuing source of the COCs. Specifically, samples were collected at MW-A1 and MW-A3 during November 2008 event, MW-A27 during April-May 2010 event, and from MW-A1, MW-A3, and MW-A25 during October-November 2010 event. The concentration data presented in Table 3 shows six petroleum based aromatics and TPH that were detected. Comparison of the detected concentrations with the corresponding groundwater screening values indicates that all concentrations were below the screening value. Note the screening levels used are the MCLs or equivalent, although the groundwater consumption pathway is not complete. Regarding MW-A27, LNAPL of 0.01 ft thickness was observed during gauging of April-May 2010 event, but was not observed during sampling two weeks later. The groundwater sample collected from MW-A27 did not contain any detectable hydrocarbons.

Attachments 1 and 2 are the underground storage tank (UST) closure letters for sites #3 and #4 located in Area 1. BTEX compounds generally present in gasoline were not detected in the groundwater. Since all the detected petroleum based aromatics concentrations are below the screening values, LNAPL is not a source for groundwater contamination in Area 1. Further, since only sheen was observed in Area 1 during the latest event, only residual LNAPL remains in Area 1 and no further active remediation is necessary. In time, due to natural attenuation processes, it is expected that the trace residual LNAPL will continue to degrade.

2.2 Risk Area 2 (Demolished Area)

Historically, fourteen wells in Area 2 had LNAPL of which eight wells have had LNAPL since 2008 (Table 2). Of the fourteen wells, one well was not gauged since 2008 and four wells are missing or were demolished. The maximum LNAPL thickness observed in Area 2 since 2008 is 0.05 ft. During the October-November 2010 monitoring event, only MW-9S and MW-10S had LNAPL with thicknesses of 0.01 and 0.03 ft, respectively. MW-9S and MW-10S are located in Area 2B within 50 ft from one another. None of the other wells in the area had LNAPL including MW-11S located 100 ft east (down gradient) of MW-10S. Therefore, the LNAPL is localized in a small area around MW-9S and MW-10S.

During November 2008, five wells had LNAPL and groundwater samples were collected from each of these wells. Sheen was observed at MW-A6 and MW-5I during gauging in April-May 2010 and was not observed during sampling two weeks later. The concentration data for detected chemicals is presented in Table 4. Specifically, the detected benzene, xylene, and MTBE concentrations were below the respective screening values. TPH-DRO concentration at MW-9S and naphthalene concentration at TP-4 exceeded the respective screening value during November 2008 event. These exceedances appear to be localized at the two wells since none of the other wells in Area 2 had exceedances for TPH-DRO and naphthalene. The average TPH-DRO concentration at MW-9S from the data collected until 2004 was 4,525 µg/L and the concentration of 720,000 µg/L appear to be an anomaly. Therefore, MW-9S will be re-sampled in March. The average concentration of naphthalene at TP-4 until 2004 was 5.09 µg/L and the concentration is decreasing and is localized to this well. PCE and TCE and their degradation products detected in this area are chlorinated solvents, hence LNAPL is not the source for these chemicals.

Therefore, the trace/residual LNAPL is not acting as a source of groundwater impact in Area 2. Also the LNAPL thickness is very small and the thickness fluctuates. Therefore, there is no need for any further remediation to address LNAPL in Area 2. Attachments 3 and 4 are the UST closure letters for sites #1 and #2 located in Area 2.

2.3 Risk Area 3 (Retained Area)

LNAPL was not observed at any well in Area 3 except MW-A4 during the April-May 2010 event. Sheen was observed at MW-A4 during gauging in April-May 2010, but it was not present during sampling two weeks later. No VOCs were detected at MW-A4. Therefore, LNAPL is not of concern in this area.

2.4 Risk Area 6 (GKN Facility)

Sheen was observed at RC2 in July, 2004. None of the other wells in this area had LNAPL. Therefore LNAPL is not of concern in this area.

3.0 CONCLUSIONS

Based on the above, LNAPL is not contributing to the groundwater impacts in any of the areas and; therefore no further remedial action is necessary to address LNAPL issues at the site.

Table 1
LNAPL Summary (1992-2010)
Boeing Tract 1, Hazelwood, Missouri

Well ID	Installation Date	LNAPL		Last Gauging Data	Last Date of LNAPL Observance	Last Observed LNAPL Thickness (ft)
		at Well Installation	Since 92			
Area 1 (Runway Protection Zone)						
MW-A1	7/12/1989	Yes	Yes	11/3/2010	11/3/2010	Sheen
MW-A2	7/12/1989	Sheen	No	--	--	--
MW-A3	7/13/1989	Yes	Yes	11/3/2010	11/3/2010	Sheen
MW-A5	7/18/1989	Yes	No	--	--	--
MW-A14	8/3/1989	Yes	No	--	--	--
MW-A15	8/3/1989	Yes	No	--	--	--
MW-A18	8/4/1989	Sheen	No	--	--	--
MW-A21	8/8/1989	Sheen	No	--	--	--
MW-A22	10/30/1989	Yes	No	--	--	--
MW-A23	10/30/1989	Yes	No	--	--	--
MW-A25	11/1/1989	No	Yes	11/3/2010	11/3/2010	Sheen
MW-A26	11/1/1989	No	Yes	11/3/2010	11/3/2010	Sheen
MW-A27	11/1/1989	No	Yes	11/3/2010	4/13/2010	0.01
MW-A28	11/1/1989	Yes	No	--	--	--
B45CMW-3A	1995	Yes	Yes	3/1/2004	3/1/2004	Sheen
B45CMW-3B	1995	Yes	Yes	11/18/1998	11/18/1998	Sheen
Area 2 (Demolished Area)						
MW-A6	7/14/1989	No	Yes	10/29/2010	4/13/2010	Sheen
MW-A9	7/17/1989	Yes	No data	--	--	--
MW-A10	7/18/1989	No	Yes	3/31/1997	12/26/1996	Sheen
MW-A11	7/19/1989	Yes	Yes	--	--	--
MW-A12	8/2/1989	Yes	Yes	12/26/1996	1/14/1990	1.13
MW-A13	8/2/1989	Yes	Yes	11/1/2010	11/18/2008	Sheen
MW-A19	8/7/1989	Yes	No	12/27/1994	2/1/1990	Sheen
MW-A20	8/7/1989	No	Yes	NA	NA	NA
MW-5I	4/21/1998	No	Yes	11/1/2010	4/13/2010	Sheen
MW-9S	12/20/2000	Yes	Yes	11/1/2010	11/1/2010	0.1
MW-10S	12/12/2000	Yes	Yes	10/29/2010	10/29/2010	0.03
TP-3	2/5/1998	No	Yes	11/1/2010	11/18/2008	0.01
TP-4	2/6/1998	No	Yes	11/1/2010	11/18/2008	0.01
TP-6	9/5/2001	Yes	Yes	10/29/2010	4/13/2010	Sheen
Area 3 (Retained Area)						
MW-A4	7/13/1989	No	Yes	10/28/2010	4/13/2010	Sheen

Notes

Sheen observed only on 07/25/2004 at RC2 (Area 6B). None of the other wells in Area 6 had LNAPL

LNAPL not observed in Areas 4,5,7,8,9

NA: Information not available

--: LNAPL was observed only at installation

Table 2
LNAPL Summary (Since 2008)
Boeing Tract 1, Hazelwood, Missouri

Well ID	Area / Sub-Area	November-2008			April-2010#			October-November 2010		
		Date	LNAPL Thickness (ft)	Depth to Water (ft btoc)	Date	LNAPL Thickness (ft)	Depth to Water (ft btoc)	Date	LNAPL Thickness (ft)	Depth to Water (ft btoc)
MW-A1	1	11/18/2008	0.01	4.84	4/13/2010	Sheen	4.88	11/3/2010	Sheen	5.26
MW-A3	1	11/18/2008	0.01	3.87	4/13/2010	0.01	4.06	11/3/2010	Sheen	4.28
MW-A25	1	NA	NA	NA	NA	NA	NA	11/3/2010	Sheen	4.36
MW-A26	1	NA	NA	NA	NA	NA	NA	11/3/2010	Sheen	6.21
MW-A27	1	NA	NA	NA	4/13/2010	0.01	3.63	NA	NA	NA
MW-A6*	2A	NA	NA	NA	4/13/2010	Sheen	4.83	NA	NA	NA
MW-9S	2B	11/18/2008	0.01	6.47	4/13/2010	0.01	4.05	11/1/2010	0.1	4.12
MW-10S	2B	11/18/2008	0.05	6.40	4/13/2010	0.01	6.11	10/29/2010	0.03	6.03
MW-5I	2B	NA	NA	NA	4/13/2010	Sheen	6.84	NA	NA	NA
TP-3	2B	11/18/2008	0.01	5.47	NA	NA	NA	NA	NA	NA
TP-4	2B	11/18/2008	0.01	3.88	NA	NA	NA	NA	NA	NA
TP-6	2B	NA	NA	NA	4/13/2010	Sheen	4.85	NA	NA	NA
MW-A13	2C	11/18/2008	Sheen	4.83	NA	NA	NA	NA	NA	NA
MW-A4	3C	NA	NA	NA	4/13/2010	Sheen	9.40	NA	NA	NA

Notes
NA: LNAPL not observed
*: Previously labeled as MW-A16
#: MW-A27, MW-A6, MW-5I, and MW-A4 had LNAPL or sheen during gauging and did not have any LNAPL during sampling two weeks later
ft: feet
btoc: below top of casing

Table 3

Groundwater Concentrations of Petroleum Related Chemicals (Detected Only) at Wells with LNAPL in Area 2

Boeing Tract 1, Hazelwood, Missouri

Sample	Screening Value*	MW-A1	MW-A3	MW-A1	MW-A3
Date Collected	(µg/L)	11/19/2008		11/4/2010	
TPH (8260/8270)					
TPH - GRO (C6 - C10) (8260)	18,100	230 J		NA	NA
TPH-DRO (C10 - C21)	34,300	2,780	2,790	NA	NA
TPH-ORO (C21 - C35)	31,800	556	493	NA	NA
VOCs (8260)					
1,2,3-Trimethylbenzene	--	6.42			
Isopropylbenzene	680	4.5 J	3.3 J	4.3 J	4.3 J
n-Butylbenzene	98.9	3 J	1.2 J	6.1	3.8 J
n-Propylbenzene	1,300	4.9 J	3.7 J	6.3	2.1 J
sec-Butylbenzene	106	4.1 J	2.1 J	4.8 J	3.6 J
tert-Butylbenzene	103	1 J	1 J	1.2 J	1.2 J

Notes:

NA: Not analyzed

J: analyte detected below reporting limit

Chemicals detected at least once are shown

--: Screening value not available

*: Screening values are MCLs or equivalent

Only petroleum based aromatic compounds are considered in this evaluation

No petroleum based aromatic compounds were detected at MW-A25

MW-A27 was sampled during April-May 2010 event and all the chemical concentrations were below detection limits

Table 4

Groundwater Concentrations of Petroleum Related Chemicals (Detected Only) at Wells with LNAPL in Area 2

Boeing Tract 1, Hazelwood, Missouri

Sample	Screening Value* (µg/L)	MW-9S	MW-10S	TP-3	TP-4	MW-A13
Date Collected		11/20/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008
Area ID		2B	2B	2B	2B	2C
TPH (8260/8270)						
TPH - GRO (C6 - C10) (8260)	18,100				645	
TPH-DRO (C10 - C21)	34,300	**762,000**	1,030	1,450 S	280 J	1,110
TPH-ORO (C21 - C35)	31,800		424	535	210 J	460 J
VOCs (8260)						
Benzene	5	1.9 J				
Isopropylbenzene	680			4.6 J		
Methyl tert-butyl ether	12				1 J	
Naphthalene	0.14				**2.4** J	
n-Butylbenzene	98.9			7.63		
n-Propylbenzene	1,300			3.3 J		
o-Xylene	1200	1.2 J				
sec-Butylbenzene	106			4.9 J		
Xylenes, Total	10,000	1.2 J				

Notes:

J: analyte detected below reporting limit

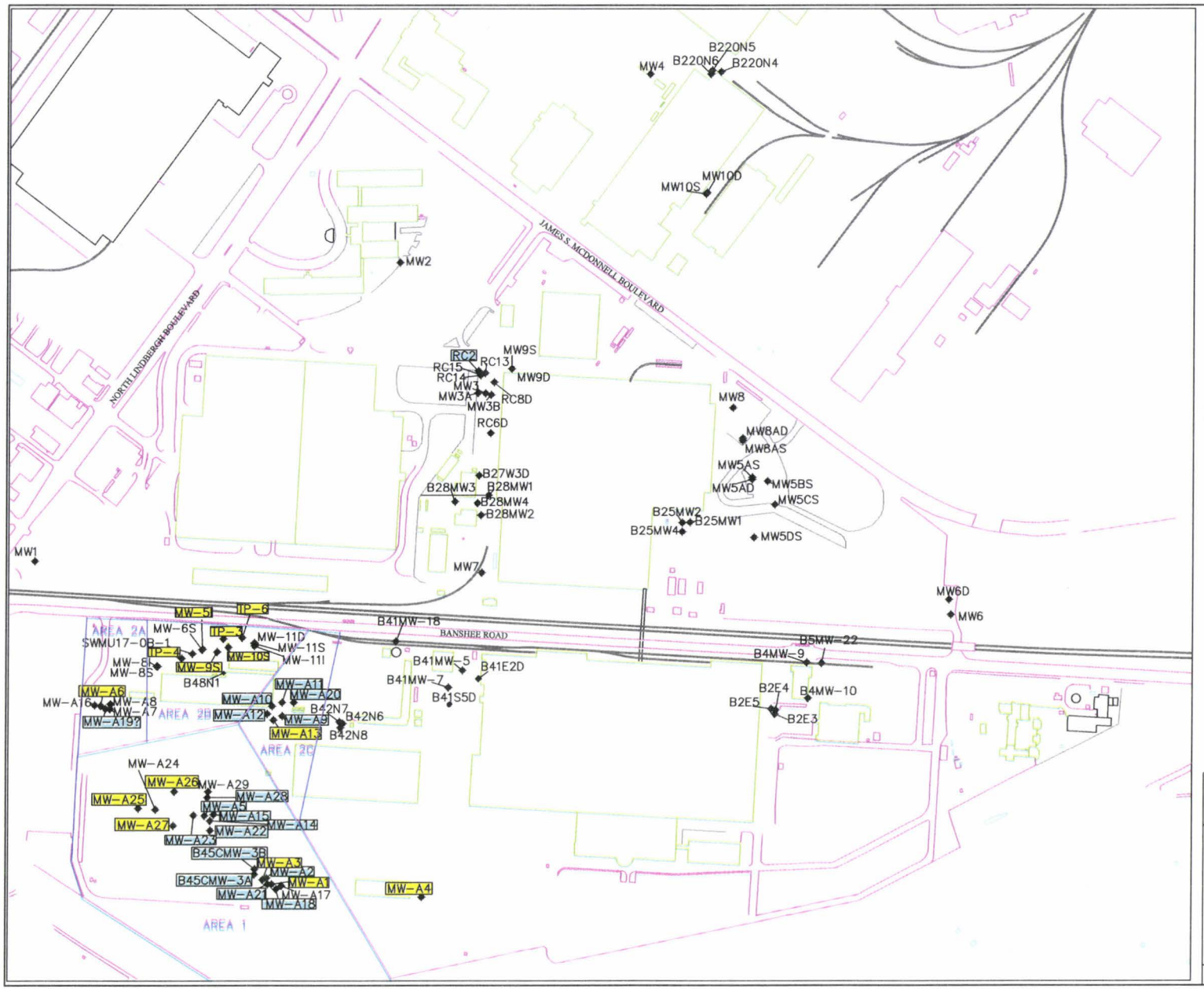
Concentrations shown in bold exceed the screening value

Chemicals detected atleast once are shown

*: Screening values are MCLs or equivalent

Only petroleum aromatic compounds are considered in this evaluation

MW-A27 was sampled during April-May 2010 event and all the petroleum based chemical concentrations were below detection limits



RAM Group of Gannett Fleming, Inc.
5433 Westheimer, Suite 725, Houston, TX

Figure 1
Location of Monitoring Wells
(Wells with LNAPL)
Boeing Tract 1
Hazelwood, Missouri

November 2010/BR | RAM Group (049992)

STATE OF MISSOURI Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

Mr. Elmer Dwyer
The Boeing Company
P.O. Box 516 MC S111-1099
St. Louis, MO 63166-0516

RE: Site #3, Tract 1, Building 45, Lindbergh Blvd., Dept. C, St. Louis, St. Louis County, MO
ST5700283, R0002516

Dear Mr. Dwyer:

The Missouri Department of Natural Resources' Hazardous Waste Program, Tanks Section, has received and reviewed a response letter dated January 28, 2002, submitted by The Boeing Company, for the above referenced site.

The laboratory analytical results of the groundwater samples collected from monitoring MW#A1, MW#A3, and MW#3A indicate the presence of petroleum hydrocarbon contamination at concentrations below the department's cleanup levels.

Therefore, based on a review of the analytical data and other information submitted, the department finds that no additional investigation or remedial action is currently required with regard to petroleum hydrocarbon spill/release. However, the department's finding is based solely on the information contained in these reports, and this finding does not constitute a certification or guarantee of the quality of the remedial action conducted or with regard to the lack of contamination on the property.

In the event a future petroleum hydrocarbon related environmental problem arises in the vicinity of this property, the department expressly reserves the right to require responsible parties to conduct additional investigation and/or remedial actions.

The monitoring wells must be properly closed and abandoned in accordance with the department's regulations. You may contact the department's Geological Survey and Resource Assessment Division for information regarding proper well closure.

Please direct questions regarding the Petroleum Storage Tank Insurance Fund to the Fund Administrator at (573) 761-4060 or (800) 765-2765.

If you have any questions regarding this letter, you may contact the project manager for this site, Mr. Matt Alhalabi of my staff at (573) 751-6822.

Sincerely,

HAZARDOUS WASTE PROGRAM

Frederick J. Hutson, R.G., Chief
Remediation Unit

FJH:mak

c: Mr. Neil Elfrink, Geological Survey and Resource Assessment Division
Mr. David Pate, Petroleum Storage Tank Insurance Fund
Mr. Mike Struckhoff, St. Louis Regional Office

STATE OF MISSOURI Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

Mr. Joseph Haake
Environmental and Hazardous Materials Services
The Boeing Company
Dept. 464C, Building 220
Mailcode S221-1400
P.O. Box 516
St. Louis, MO 63166

RE: McDonnell Douglas Site #4, Banshee Rd., Bldg. 45, St. Louis, St. Louis County, MO
ST5700085, R0002477

Dear Mr. Haake:

The Missouri Department of Natural Resources' Hazardous Waste Program, Tanks Section, received and reviewed a groundwater monitoring report dated May 10, 2002, submitted by The Boeing Company, for the above referenced site.

The report documents the laboratory results of the groundwater samples collected during April 2002. The laboratory results indicate petroleum hydrocarbon contamination is below the department's cleanup levels.

Based on a review of the analytical data and other information submitted, the department finds that no additional investigation or remedial action is currently required with regard to petroleum hydrocarbon spill/release. However, the department's finding is based solely on the information contained in these reports, and this finding does not constitute a certification or guarantee of the quality of the remedial action conducted or with regard to the lack of contamination on the property.

In the event a future petroleum hydrocarbon related environmental problem arises in the vicinity of this property, the department expressly reserves the right to require responsible parties to conduct additional investigation and/or remedial actions.

Please direct questions regarding the Petroleum Storage Tank Insurance Fund to the Fund Administrator at (573) 761-4060 or (800) 765-2765.

If you have any questions, please contact the project manager for this site, Mr. Matt Alhalabi at (573) 751-6822.

Sincerely,

HAZARDOUS WASTE PROGRAM

Frederick J. Hutson, R.G., Chief
Remediation Unit

FJH:maj

c: Mr. David Pate, Petroleum Storage Tank Insurance Fund
Mr. Mike Struckhoff, St. Louis Regional Office

STATE OF MISSOURI
Mel Carnahan, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

February 23, 1999

Mr. Elmer Dwyer
Boeing Company
P.O. Box 516 MC S111-1099
St. Louis, MO 63166-0516

RE: McDonnell Douglas Site #1, Lambert Building #45-K, Bridgeton, MO - R0002517

Dear Mr. Dwyer:

The Tanks Section of the Hazardous Waste Program has received and reviewed the January 12, 1999, Soil Investigation Report for the site listed above.

Based upon a review of the analytical data and other information submitted, the department finds that no additional investigation or remedial action is currently required with regard to these petroleum substances. However, the department's finding is based solely on the information contained in these reports, and this finding does not constitute a certification or guarantee of the quality of the remedial action conducted or with regard to the lack of contamination on the property.

In the event a future petroleum-related environmental problem arises in the vicinity of this property, the department reserves the right to require responsible parties to conduct additional investigation and/or remedial actions.

If you have any questions regarding this letter, you may contact Ms. Julie Pearson of my staff at (573) 751-6822.

Sincerely,

HAZARDOUS WASTE PROGRAM

Jim Growney, Chief
Remediation Unit

JG:jpe

c: Mr. David Pate, Williams and Company
St. Louis Regional Office

STATE OF MISSOURI Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

Mr. Joseph Haake
Environmental and Hazardous Materials Services
The Boeing Company
Dept. 464C, Building 220
Mailcode S221-1400
P.O. Box 516
St. Louis, MO 63166

RE: McDonnell Aircraft, Tract II, Site No. 2, 4610 N. Lindbergh, Dept. 64C, St. Louis, St. Louis County, MO - ST0005887, R0002046

Dear Mr. Haake:

The Missouri Department of Natural Resources' Hazardous Waste Program, Tanks Section, has received and reviewed a groundwater monitoring report dated May 10, 2002, submitted by The Boeing Company, for the above referenced site.

The report documents the laboratory results of the groundwater samples collected during April 2002. The laboratory results indicate petroleum hydrocarbon contamination is below the department's cleanup levels.

Based on a review of the analytical data and other information submitted, the department finds that no additional investigation or remedial action is currently required with regard to petroleum hydrocarbon spill/release. However, the department's finding is based solely on the information contained in these reports, and this finding does not constitute a certification or guarantee of the quality of the remedial action conducted or with regard to the lack of contamination on the property.

In the event a future petroleum hydrocarbon related environmental problem arises in the vicinity of this property, the department expressly reserves the right to require responsible parties to conduct additional investigation and/or remedial actions.

Please direct questions regarding the Petroleum Storage Tank Insurance Fund to the Fund Administrator at (573) 761-4060 or (800) 765-2765.

If you have any questions, please contact the project manager for this site, Mr. Matt Alhalabi at (573) 751-6822.

Sincerely,

HAZARDOUS WASTE PROGRAM

Frederick J. Hutson, R.G., Chief
Remediation Unit

FJH:maj

c: Mr. David Pate, Petroleum Storage Tank Insurance Fund
Mr. Mike Struckhoff, St. Louis Regional Office